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Title: **Scientific Opportunities for Neutron Scattering at 30-tesla**

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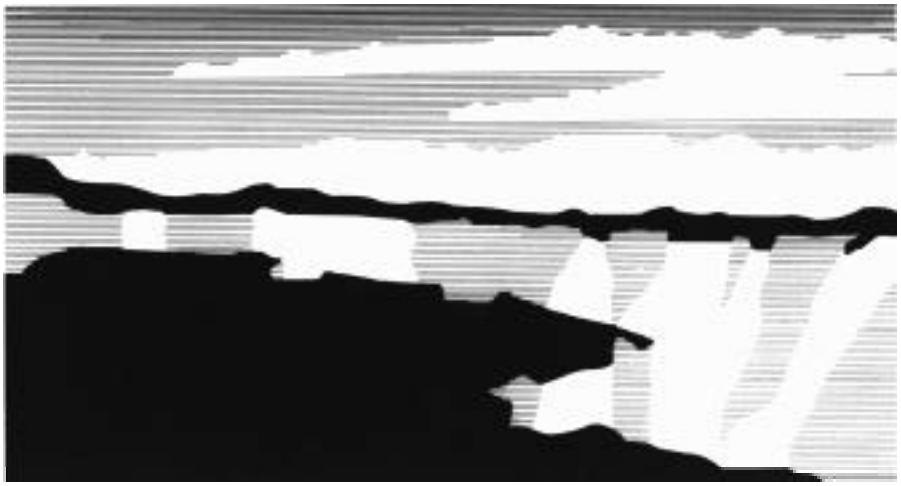

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Scientific Opportunities for Neutron Scattering at 30-tesla

On January 14th and 15th 1999, a scientific workshop on opportunities for neutron scattering in magnetic fields up to 30-tesla was held in Los Alamos, under the joint sponsorship of LANSCE, the Center for Materials Science and the National High Magnetic Field Laboratory (NHMFL, a 3-center program based at Tallahassee and Gainesville in Florida and Los Alamos in New Mexico). The context of this is that the NHMFL and LANSCE are constructing a unique new pulsed water-cooled split-pair magnet system specifically designed for neutron scattering studies. The design goals have been to achieve a 30-T peak field, with 2.3 ms semi-sinusoidal pulse length, a magnet repetition rate of 2Hz, a fully illuminated/viewed sample size of 5mm, a 20-mm clear bore in the magnet, ± 4° vertical divergence and 4 x 73° horizontal divergence. The magnet and power supply were described by Chuck Mielke (NHMFL-Los Alamos), while 2 new high-intensity instruments, that are likely homes for the magnet were described by Mike Fitzsimmons (LANSCE) and Collin Broholm (Johns Hopkins University).

43 participants came from Japan, Germany and the Netherlands, in addition to 9 U.S. universities, 5 U.S. national laboratories and several Los Alamos divisions. After welcome talks from Jack Crow (Director of the NHMFL) and Roger Pynn (LANSCE Division Director), Ivan Schuller (University of California, San Diego) gave an animated and provocative overview of "Issues in Magnetism" focussing on small magnetic structures like dots and nanocrystals and inhomogeneous structures like films and multilayers, and reaffirmed the central role that neutrons have in this research. He was followed by Bernhard Keimer (Princeton) who gave several examples of candidate scattering experiments that need to be done in the field range between 12 and 30T, including the spin-Peierls system $CuGeO_3$ and various problems in the High-T_c cuprates. There were also talks on CMR manganites (Sang-Wook Cheong – Bell :Labs./Rutgers), high-T_c cuprates (Peng-Cheng Dai – Oak Ridge), uranium intermetallic compounds (Karel Prokes – HMI-Berlin; Heinz Nakotte – New Mexico State University), rare earth-transition metal hard magnets (Paul Frings – University of Amsterdam), quantum spin systems (Collin Broholm – Johns Hopkins University), molecular magnets (Jonathan Friedman – SUNY Stony Brook), molecular conductors (Jim Brooks – Florida State University), crystal-field level mixing (Sandy Kern – Colorado State University), magnetisation in paramagnets (Feri Mezei – LANSCE), and Ce-based heavy fermions (Robert Modler – Ames).

There were also talks on experience studying magnetic materials at the Advanced Photon Source (George Srajer – Argonne) and with the 14.5T superconducting split-pair magnet at HMI-Berlin (Karel Prokes), which currently provides the highest d.c. field available at any neutron scattering facility. In addition, Ward Beyermann (University of California Riverside) led a discussion on

sample environment equipment for the pulsed magnet: one will likely need a plastic cryostat with sapphire or glass tails in the neutron beam. It was also noted that one should perform simultaneous magnetisation measurements, as a check that one is getting results consistent with bulk measurements, and to measure heating of the sample. At this point, interest seems to be evenly split between diffraction and inelastic scattering experiments, with some additional interest in doing reflectometry and SANS, particularly from superconducting flux-line lattices. Most experiments are envisaged to involve single crystals, though Paul Frings (University of Amsterdam) argued that there are some very interesting powder diffraction experiments to be done on hard magnets, by using the field to align the particles and the neutrons to measure the consequent texture as a function of field.

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